desire to repeat that judicious internal and general treatment should always receive due consideration; for the same laws in pathology that occasion syphilis to localize itself here and prove so obstinate hold good for eczema of this region, and everyone knows the efficacy of internal medication in syphilis of the palm, and how rebellious, on the other hand, it usually is to mere local remedies.

I have thus directed attention in a very practical way to the local treatment of this important and widespread disease as it occurs on the several regions of the general surface where it is most prone to manifest itself. Mention has been made of the most valuable remedies and methods of therapy, but it has been beyond the scope of this article to refer to all of the remedies of merit and their application. No special attention has been given to the internal or general treatment of the disease, because their importance and value are so great, and the field so extensive, that this topic must be reserved for another occasion.

A STUDY OF THIRTY-ONE CASES OF CHLOROSIS,

WITH SPECIAL REFERENCE TO THE ETIOLOGY AND THE DIETETIC TREATMENT OF THE DISEASE.

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The fact that the literature relating to the etiology of chlorosis is increasing yearly shows that none of the hypotheses thus far offered is entirely satisfactory.

Up to the year 1872 disorders of the female generative organs were regarded as giving rise to the complex of symptoms which we designate as chlorosis. This view was based essentially upon the observation that chlorosis occasionally develops in young girls in whom menstruation has previously been more or less regular, but has ceased upon the development of the disease in question. Virchow[1] was the first to show that such a hypothesis is untenable, as he found the existence of pelvic disease inconstant in the bodies of chlorotic females. His anatomical observations, on the other hand, led him to believe that an etiological connection exists between chlorosis and a congenital hypoplasia, or imperfect development of the cardio-vascular system, especially of the aorta. Similar observations were made by Rokitansky,[2] who mentions a case in which the abdominal aorta was no larger than an iliac or even a carotid artery. This hypoplasia Virchow refers to an abnormal condition of the mesenchyma, resulting in a defective development of the organs which are derived from this layer, viz., the bloodvessels, the blood, and the blood-forming organs—the bone-marrow and the spleen. There can be no doubt that such an anomalous condition must be looked upon as an important predisposing cause; but it can hardly be regarded as the cause of the disease, as the number of cases in which chlorosis is clinically observed is greater than that in which a hypoplasia of the cardio-vascular system is seen upon the post-mortem table. The fact, moreover, that the disease promptly yields to treatment in the great majority of instances is strongly against the value of Virchow's hypothesis.

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[1] R. Virchow: Ueber die Chlorose und die damit zusammenhängenden Anomalien des Gefässapparates, etc. Berlin, 1872.

[2] Cited by Virchow, loc. cit.

Rosenbach[1] and others look upon tight corset-lacing and the resulting compression of the respiratory organs as the principal causes of chlorosis, and believe that the "excess" of hæmoglobin disappears as a consequence.

Meinert[2] likewise regards the corset as the primary cause, but ascribes the chlorosis to gastroptosis with vertical or subvertical position of the stomach, which he claims to have observed in every instance. In 15 per cent. of his cases, moreover, he was able to demonstrate the existence of a movable kidney. According to his view, the gastroptosis is an anatomical factor causing an increased irritability of the sympathetic nerve-plexuses in the abdomen, and notably the solar plexus, which governs the production of hæmoglobin in the spleen. A chlorotic attack follows whenever, owing to special psychic or physical over-exertion, increased demands are made upon the nervous system. In short, according to Meinert, chlorosis is essentially a neurosis dependent upon the existence of enteroptosis.

Chlorosis not infrequently occurs in girls who have never worn a corset, so that this factor may be disregarded. The question, however, remains: Does a gastroptosis, viz., splanchnoptosis, occur in every case of chlorosis whether or not a corset has been worn? Leo[3] finds gastroptosis to be the rule in cases in which a corset has been worn, but also states that he has found the lower curvature of the stomach well above the umbilicus in a number of instances.

Pick[4] reports upon "atonic conditions of the stomach and frequent dilatation." According to him, the chlorosis is due to the absorption of poisonous products of albuminous decomposition, and the deleterious effects of these upon the general metabolism. He also states that the breath of chlorotic patients frequently has the odor of skatol. His treatment accordingly consists in the administration of creosote and in gastric lavage. In sixteen cases thus treated good results were noted.

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[1] O. Rosenbach: Korsett und Bleichsucht, 1895.

[2] Meinert: Zur Aetiologie der Chlorose. Wiener med. Wochensch., 1893.

[3] H. Leo: Ueber Gastroptose und Chlorose. Deutsche med. Wochensch., 1896, p. 177.

[4] A. Pick: Zur Therapie der Chlorose. Wiener med. Wochensch., 1891, p. 939.

It seemed of interest to the writer to determine, first, the frequency with which anæmic conditions in general are associated with splanchnoptosis and atony; and, secondly, to repeat the work of Meinert, Pick, and Leo. The results are given in Tables I., II., and III.

TABLE I.

Showing the relation existing between splanchnoptosis and anæmia, viz., chlorosis.

No.	Sex.	Age.	Gastroptosis.	Nephroptosis.	Hæmoglobin.
1 . . .	F.	?	No.	Yes.	80 pr. ct.[1]
2 . . .	M.	29	Yes.	“	50 “
3 . . .	F.	?	No.	“	30 “
4 . . .	F.	19	“	“	80 “
5 . . .	F.	?	“	“	62 “
6 . . .	F.	38	“	“	50 “
7 . . .	F.	60	“	“	35 “
8 . . .	F.	?	“	“	35 “
9 . . .	F.	44	Yes.	“	75 “
10 . . .	F.	?	“	No.	75 “
11 . . .	F.	?	No.	Yes.	40 “
12 . . .	F.	?	“	“	80 “
13 . . .	M.	56	Yes.	“	80 “
14 . . .	F.	?	No.	“	65 “
15 . . .	F.	30	Yes.	“	50 “
16 . . .	F.	?	No.	“	70 “
17 . . .	F.	?	Yes.	“	60 “
18 . . .	F.	32	“	“	80 “
19 . . .	M.	22	No.	“	30 “
20 . . .	M:	40	“	“	85 “
21 . . .	F.	?	“	“	65 “
22 . . .	F.	?	“	“	60 “
23 . . .	F.	?	Yes.	“	70 “
24 . . .	M.	22	No.	“	70 “
25 . . .	F.	36	“	“	33 “
26 . . .	F.	?	“	“	65 “
27 . . .	F.	?	Yes.	“	60 “
28 . . .	F.	?	No.	“	65 “
29 . . .	F.	?	Yes.	“	80 “
30 . . .	M.	26	“	“	110 “
31 . . .	F.	18	“	“	50 “
32 . . .	F.	?	No.	“	35 “
33 . . .	F.	19	“	“	55 “
34 . . .	F.	24	Yes.	No.	35 “
35 . . .	F.	29	No.	Yes.	60 “
36 . . .	F.	28	“	“	40 “
37 . . .	F.	?	“	“	50 “
38 . . .	F.	22	Yes.	“	25 “
39 . . .	F.	25	No.	“	65 “

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[1] These figures have reference to the scale of Fleischl's hæmometer.

TABLE II.

Showing the relation existing between simple atony of the stomach and anæmia, viz , chlorosis.

No.	Age.	Sex.	Hæmoglobin.
1	29	M.	50 per cent.
2	39	F.	75 "
3	58	M.	60 "
4	?	F.	80 "
5	?	F.	80 "
6	40	M.	85 "
7	21	M.	60 "
8	?	F.	60 "
9	23	M.	70 "
10	40	F.	70 "
11	22	M.	70 "
12	?	F.	50 "
13	?	F.	65 "
14	40	F.	50 "
15	?	F.	60 "
16	12	M.	65 "
17	26	M.	80 "
18	20	F.	70 "
19	29	F.	60 "
20	17	F.	25 "
21	20	F.	25 "
22	28	F.	40 "
23	25	F.	65 "
24	18	F.	45 "
25	12	F.	66 "

An examination of Table I. shows that splanchnoptosis is associated with anæmia in a fairly large percentage of cases, and this is true more particularly of nephroptosis. There remains, however, a not inconsiderable number in which amounts of hæmoglobin are found which, for city-dwellers at least, must be considered as nearly normal, and in one case, notwithstanding the existence of a most marked gastroptosis and nephroptosis, 110 per cent. of hæmoglobin was observed with Fleischl's hæmometer.

The same may be said of simple, uncomplicated atony.

An analysis of Table III. shows that splanchnoptosis is by no means invariably associated with chlorosis, although a corset was worn in almost every instance. The conclusion, hence, appears justifiable that *while splanchnoptosis is frequently observed in cases of chlorosis, it cannot be regarded as the essential causative factor.*

If, moreover, we study the cases which are associated with splanchnoptosis and atony, it will be found that while with appropriate treatment the chlorotic condition gradually disappears, the splanchnoptosis and atony still persist. Atony of the stomach, as well as splanchnoptosis, is quite common in the male, in whom chlorosis is far less frequently observed than in the female, not to speak of the *married* female, in which descent of the stomach and nephroptosis are so often observed in the absence of chlorosis.

Atony of the stomach and splanchnoptosis have in themselves no part in the causation of chlorosis. In making this statement, however, the writer does not wish to convey the impression that the existence of splanchnoptosis is of no significance in such cases. There can be no doubt that the anæmic condition will be more difficult to treat, especially if a marked grade of nephroptosis is also present.

It has been pointed out that chlorosis, according to Meinert's idea, is essentially an affection of the sympathetic nervous system. This theory is also held by Jones and Murri.

Jones[1] found that in rabbits, after section of the splanchnic nerves, comparatively slight stimulation, such as the injection into the intestine of dilute saline solution, is sufficient to produce marked hyperæmia of the intestinal mucosa and hemorrhages. Having in view the well-known fact that dilatation of the bloodvessels supplying the sexual organs of the female occurs during the process of menstruation, he assumed that under certain conditions the vaso-dilatation is present in other organs supplied by the abdominal sympathetic system, leading to gastro-intestinal hyperæmia, and even to hemorrhages, which in turn give rise to chlorosis. A number of data can be brought forward in support of this view. Hässlin[2] was able to demonstrate the presence of hæmatin and iron in the feces of numerous cases of chlorosis. Kuttner[3] also has drawn attention to the fact that gastric hemorrhages are by no means uncommon in cases of chlorosis, although hæmatemesis does not necessarily occur. He states that gastric hemorrhages occurring periodically are not infrequently associated with menstruation, and that the periodical hemorrhages observed in cases of amenorrhœa stand in a generic relation to this condition. He does not regard such hemorrhages as taking the place of the physiological menstrual flow, but agrees with Jones,[4] that the stimulus caused by the hyperæmic condition of the sexual organs during the process of menstruation may, under certain conditions, extend to other portions of the sympathetic nervous system, causing hyperæmia. According to modern views, however, a hemorrhage—aside from traumatism—can only occur when the bloodvessel-walls or their surroundings, such as the gastro-intestinal mucosa, are diseased.[5] In this connection it is of interest to note that Virchow[1] found the arteries of chlorotic females abnormally thin throughout, owing to atrophy of the muscular coat, and that the intima frequently was waxy.

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[1] Ll. Jones: Preliminary Report on the Causes of Chlorosis. Brit. Med. Journ., 1893, ii. p. 670.

[2] v. Hässlin: Münch. med. Wochensch., 1890, No. 14.

[3] L. Kuttner: Ueber Magenblutengen und besonders über deren Beziehungen zur Menstruation. Berlin. klin. Wochensch., 1895, Nos. 7, 8, and 9.

[4] Jones, loc. cit.

[5] M. Bresgen: Ueber Epistaxis. Eulenburg's Real-Encyclop., 1886, vol. vi. p. 474.

Kuttner has drawn attention to the fact that the macroscopic and even the microscopic examination of the gastric contents is not always sufficient to demonstrate the presence or absence of blood, as the appearance remains unaltered if the hemorrhage has been slight. Whenever, then, the macroscopic and microscopic examination yields negative results the method recommended by Müller[2] and Weber[3] should be employed. To this end the gastric contents are treated with a few cubic centimetres of concentrated acetic acid and extracted with ether. Should the ether not separate out as a clear layer after a few minutes, a few drops of alcohol are added. If the ether then remains colorless, no blood-pigment is present, while a brownish-red color indicates the presence of acetate of hæmatin. As a similar but yellowish-brown and much less intense discoloration of the ether may be produced by other pigments, such as biliary coloring-matter, it is well in doubtful cases to test the ethereal extract with tincture of guaiacum. A positive result indicates the presence of blood-coloring matter. The same may be said if, upon spectroscopic examination of the ethereal extract, an absorption band is discovered at the junction of the red and yellow.

Most valuable is the iron-test of Korczynski and Jaworski.[4] A small amount of the sediment to be examined is treated with a pinch of potassium chlorate and a drop of concentrated hydrochloric acid, and the mixture carefully heated until it has become decolorized. If necessary, more of the hydrochloric acid is added. As soon as all the chlorine has been driven off, one or two drops of a dilute solution of potassium ferrocyanide are added, when in the presence of blood-coloring matter a distinctly blue color is obtained, owing to the formation of Prussian-blue.

The writer has been able to examine the gastric contents of only five chlorotic patients in this manner. In four a negative result was obtained; the fifth was one of ulcer complicating the chlorosis, and in this case blood-coloring matter was found.

Opposed to the correctness of Jones's hypothesis, however, is the fact that chlorosis is at times observed in young girls in whom menstruation has not as yet been established. The writer has a young chlorotic female under observation at the present time in whom chlorosis developed at the age of sixteen years, while the first signs of menstruation did not appear before the twentieth year. It is difficult, moreover, to understand why the blood-condition usually improves upon the administration of iron, unless iron causes vaso-constriction, which is not borne out by experience, as hyperæmia of the gastrointestinal mucosa and even inflammation may result from its use.

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[1] Virchow, loc. cit.

[2] Seiffert und Müller: Taschenbuch der med.-klin. Diagnostik, 1893, p. 69.

[3] H. Weber: Ueber den Nachweis des Blutes in dem Magen und Darminhalte. Berlin. klin. Wochensch., 1893, No. 19.

[4] Korczynski und Jaworski: Klinische Befunde bei Ulcus und Carcinoma. Deutsche med. Wochensch., 1886, Nos. 47-49.

An analysis of post-mortem records, as far as such have been accessible to the writer, shows, furthermore, that ecchymoses of the gastrointestinal mucosa are by no means commonly observed. Hoffmann,[1] also, speaks of the infrequency of hemorrhages in chlorosis, and contrasts chlorosis in this respect with other blood-diseases. The conclusion, hence, appears justifiable that *gastrointestinal hemorrhages cannot be regarded as the sole cause of chlorosis.* It is the writer's belief that when they occur they are the *result* of the anæmic condition, and not the cause.

Murri[2] likewise regards chlorosis as a vasomotor neurosis. According to him, an unequal distribution of the blood and an abnormal rapidity of flow, both of which are the result of abnormal impulses starting from the generative organs of the female, constitute the essential factors. Owing to the abnormal excitability of the vasomotor nerves the blood accumulates in the bloodvessels of the viscera, while the peripheral circulation, in consequence of vaso-constriction, is slower than normal. These deviations from the normal circulation cause an increased destruction of red corpuscles, in consequence of the altered chemical composition of the blood. If, furthermore, the peripheral circulation is more especially disturbed by cold and similar causes, the already existing anæmia is still further increased. As Murri has not yet published his observations in detail, it is impossible to analyze his hypothesis at present. So much, however, is certain that cold is capable of exerting a most deleterious influence upon the blood of chlorotic patients. v. Noorden[3] thus cites two cases of chlorosis in which, following the application of cold douches and the wet sheet, the previously light-colored urine became dark and very rich in hydrobilirubin, which modern researches have shown to indicate an increased destruction of hæmoglobin. The observation, moreover, is quite common that chlorotic patients frequently are made distinctly worse when permitted to indulge in sea-bathing without previous preparation. v. Noorden, however, states that he does not attach much importance to his observations upon the effect of cold as far as the etiology of chlorosis is concerned, and adds that similar results may frequently be obtained in the case of weakly patients.

It has been pointed out that Pick considers chlorosis the result of an autointoxication, and that he claims to have obtained good results from gastric lavage and the administration of creosote.

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[1] F. A. Hoffmann: Lehrbuch der Constitutionskrankheiten, p. 45. Stuttgart, 1893.

[2] Murri: Pathogénie de la Chlorose. Semaine Méd., 1894, p. 162.

[3] v. Noorden: Lehrbuch der Pathologie des Stoffwechsels, pp. 265-346.

Clark[1] may be regarded as the principal exponent of this school; but while Pick refers the autointoxication to atony and dilatation of the stomach, Clark regards the constipation which so often accompanies chlorosis, and the absorption of poisonous products of albuminous putrefaction, as the essential causes of the disease. This view is also held by Nothnagel.[2]

According to Bunge,[3] increased intestinal putrefaction, resulting in an increased production of sulphuretted hydrogen, must be regarded as the primary cause of chlorosis. He reasons as follows: during the period of puberty the female assimilates an excess of iron and stores it in the liver, in order to supply the fœtus, when pregnancy occurs, for the first year. Whenever, then, this process is interfered with, in consequence of the excessive production of sulphuretted hydrogen in the intestinal tract, the iron which is introduced in the form of food being transformed into insoluble sulphide of iron, chlorosis will result if the accumulation of iron still continues. The increased degree of intestinal putrefaction Bunge and his followers refer to a deficient secretion of hydrochloric acid in the stomach. The correctness of the hypothesis that chlorosis is essentially the result of an autointoxication, due to increased intestinal putrefaction, has been rendered doubtful by the researches of Rethers,[4] who found that the conjugate sulphates were usually not increased in cases of chlorosis.

In a previous communication[5] the writer has pointed out that in diseases of the stomach the elimination of indican must be considered as the more important factor in the determination of the degree of intestinal putrefaction, as the phenols are not necessarily produced in excessive amounts, so that the estimation of the conjugate sulphates does not furnish as valuable information as the examination for indican. It was, hence, thought advisable to examine systematically the urine of chlorotic patients. Attention was at the same time directed to the existence of constipation. The results obtained are given in Table III.

An analysis of this table shows that an excess of indican in the urine of chlorotic patients is rather the exception than the rule, and that while constipation exists in the majority of cases, normal relations are found in a not inconsiderable number.[6] The conclusion thus appears justifiable that *constipation and increased intestinal putrefaction, as far as the known aromatic bodies are concerned, cannot be regarded as essential factors in the production of chlorosis.*

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[1] Clark: Chlorosis. Lancet, 1887, ii. p. 1003.

[2] Nothnagel: Ueber Chlorose. Wiener med. Presse, 1891, p. 1925.

[3] Bunge: Physiologische Chemie, 1887, p. 86; also, Verhandlungen des Congresses für innere Medizin, 1895.

[4] Th. Rethers: Beiträge zur Pathologie der Chlorose. Diss. Berlin, 1891.

[5] C. E. Simon: Modern Aspect of Indicanuria. AMERICAN JOURNAL OF THE MEDICAL SCIENCES, July and August, 1895.

[6] The writer has pointed out at various places that constipation in itself does not cause increased indicanuria; this fact is also well shown in the table. See C. E. Simon, Clinical Diagnosis. Philadelphia, 1896.

TABLE III.

No.	Name.	Sex.	Age	Hb. pr.ct.	HCl.	Indican.	Atony.	Dilatation.	Gastroptosis.	Nephroptosis.	Constipation.	Remarks.
1	Miss B.	F.	20	50	Increased.	Increased.	No.	No.	No.	No.	Yes.	Ulcus ventriculi.
2	Miss T.	F.	24	45	Increased.	Not increased.	No.	No.	No.	No.	No.	
3	D. S.	F.	29	28	Increased.	Not increased.	No.	No.	No.	No.	Yes.	
4	Miss S.	F.	22	55	Absent.	Increased.	No.	No.	No.	No.	Yes.	
5	Miss S.	F.	17	60	Diminished.	Increased.	No.	No.	No.	No.	Yes.	
6	Miss R.	F.	30	50	Normal.	Not increased.	No.	No.	No.	Yes.	No.	
7	Miss G.	F.	?	35	Normal.	Not increased.	No.	No.	No.	Yes.	No.	
8	Miss S.	F.	19	55	Absent.	Increased.	No.	No.	No.	Yes.	No.	
9	Miss A.	F.	24	35	Absent.	Increased.	Yes.	No.	Yes.	No.	Yes.	
10	Miss B.	F.	29	60	Increased. 0.3 pr.ct.	Normal.	Yes.	No.	Yes.	Yes.	No.	
11	Miss B.	F.	15	40	Normal.	Not increased.	No.	No.	No.	No.	No.	
12	A.B.B.	F.	17	25	Increased. 0.5 pr.ct.	Not increased	Yes.	No.	No.	No.	No.	
13	Miss S.	F.	20	25	Diminished.	Increased.	Yes.	No.	Yes.	No.	No.	
14	Miss B.	F.	28	40	Increased. 0.5 pr.ct.	Not increased.	Yes.	No.	No.	Yes.	No.	
15	Miss B.	F.	24	55	Normal.	Not increased.	No.	No.	No.	No.	No.	
16	Miss F.	F.	25	50	Diminished.	Increased.	No.	No.	No.	No.	No.	
17	Miss H.	F.	?	50	Diminished.	Increased.	No.	Yes.	No.	Yes.	No.	Ulcus.
18	Miss K.	F.	?	45	Normal.	Not increased.	No.	No.	No.	No.	No.	
19	Miss Y.	F.	22	25	Normal.	Not increased.	Yes.	No.	Yes.	Yes.	No.	
20	Miss L.	F.	25	65	Normal.	Not increased.	Yes.	No.	No.	Yes.	No.	
21	Miss B.	F.	18	45	Increased. 0.5 pr.ct.	Not increased.	Yes.	No.	No.	No.	Yes.	
22	Miss S.	F.	24	75	Normal.	Not increased	No.	No.	No.	Yes.	No.	Has been under treatment for chlorosis.
23	Miss W.	F.	19	75	Diminished.	Increased.	Yes.	No.	No.	No.	No.	Has been under treatment for chlorosis.
24	Miss G.	F.	19	25	Absent.	Not increased.	Yes.	No.	Yes.	Yes.	Yes.	Lactic acid.
25	Miss H.	F.	21	20	Absent.	Not increased.	Yes.	No.	Yes.	Yes.	Yes.	Lactic acid.
26	E. W.	F.	17	37	....	Not increased.	No.	No.	No.	No.	Yes.	
27	M. G.	F.	15	33	Increased.	Not increased	Yes.	No.	Yes.	Yes.	Yes.	
28	M. C.	F.	24	18	Increased.	Increased.	Yes.	No.	No.	No.	Yes.	Ulcus.
29	L. S.	F.	30	30	Normal.	Not increased.	Yes.	No.	No.	No.	Yes.	
30	A. W.	F.	35	33	Normal.	Not increased.	No.	No.	Yes.	Yes.	Yes.	
31	E. B.	F.	12	55	Absent.	Increased.	Yes.	No.	No.	No.	No.	

It has been pointed out that Bunge and others regard a diminished secretion of hydrochloric acid in the stomach as the principal cause of increased putrefaction, and, hence, as the primary cause of chlorosis. It will be necessary then to study briefly the various observations which have been made in this direction.

Manassein[1] was the first to note that, in animals, during fever and in anæmic conditions practically no gastric juice is secreted, and, hence, concluded that in the human being also the secretion of hydrochloric acid is diminished in anæmic conditions, such as chlorosis.

Zander[2] found that better results are obtained in the treatment of chlorosis under the administration of hydrochloric acid than of iron, and thus arrived at the same conclusion.

Mordhorst[3] takes the same stand, as he claims to have found a smaller amount of hydrochloric acid, on an average, in cases of chlorosis than normally.

Lenhartz,[4] using Congo-red as a test, observed the absence of free hydrochloric acid in 45.6 per cent. of his cases, and also states that on an average the total acidity was below normal.

Rosenbach[5] obtained similar results.

Ritter and Hirsch,[6] employing the method of Kahn and v. Mehring, likewise found amounts which on an average were below normal, but not to a marked degree.

Increased amounts of free hydrochloric acid were found by Riegel, Grüne, Osswald, Schätzell, and Cantu.

In three cases of chlorosis which were carefully studied by Riegel[7] the total acidity in terms of hydrochloric acid corresponded to 0.22 to 0.26 per cent. in the first, 0.23 to 0.30 per cent. in the second, and 0.28 to 0.46 per cent. in the third. In this manner he explains the not infrequent occurrence of gastric ulcer in cases of chlorosis and the anæmias in general.

Grüne[8] obtained amounts exceeding 0.5 per cent. In one instance he found 0.58 per cent. He states that he never found less than 0.28 per cent. His material consisted of twenty-eight cases, in nine of which the chlorosis was associated with ulcer.

Schätzell[9] observed hyperacidity in 73 per cent., a normal acidity in 20 per cent., and subacidity in 7 per cent. of his cases.

Osswald[10] examined twenty-one cases and found a total acidity, corresponding to 0.20 per cent., in only two cases; in the greater number more than 0.25 per cent. was found, and in some instances even 0.5 per cent. The amount of free hydrochloric acid varied between 0.07 and 0.25 per cent, with an average of 0.15 per cent.

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[1] Manassein: Virchow's Archiv, 1872, vol. lv.

[2] Zander: Virchow's Archiv, 1881, vol. lxxviii.

[3] Mordhorst: Diss. Kiel, 1893.

[4] Lenhartz: Deutsche med. Wochensch., 1890, No. 5.

[5] Rosenbach: Entstehung und Behandlung der Chlorose. Leipzig, 1892.

[6] Ritter und Hirsch: Zeitsch. für klin. Med., vol. xiii. p. 430.

[7] Riegel: Zeitsch. für klin. Med., vol. xii.; also Deutsche med. Wochensch., 1886, No. 52.

[8] Grüne: Diss. Giessen, 1890.

[9] Schätzell: See Hoffmann's Constitutions-Krankheiten.

[10] Osswald: München. med. Wochensch., 1894, Nos. 27 and 28.

Leube[1] states that while subacidity is the rule in chlorosis, exceptions are not uncommon.

Cantu[2] claims that hyperchlorhydry is characteristic of chlorosis, which may thus be distinguished from other forms of anæmia.

On the other hand, there are observers who maintain that no rule can be laid down regarding the secretion of hydrochloric acid in cases of chlorosis. Rosenheim,[3] v. Noorden,[4] Buzelygan[5] and Gluzinski, and Hoffmann[6] found an increased degree of the total acidity in some, and in others a diminished amount, but in both groups but little beyond the normal. Usually the secretion of hydrochloric acid was normal. The same conclusion has also recently been reached by Schroth.[7]

The author's results are given in Table III.

Salzer's test-meal was employed in every case. For breakfast the patient received 30 grammes of lean, cold roast beef, hashed or cut into pieces sufficiently small not to obstruct the lumen of the stomach-tube, 250 c.cm. of milk, 60 grammes of rice, and one soft-boiled egg. Exactly four hours later the second meal was taken, consisting of 35 to 70 grammes of stale wheat-bread and 300 to 400 c.cm of water. The gastric contents were withdrawn one hour later. In this manner the gastric juice is not only obtained at the height of digestion, but an idea may at the same time be formed of the motor power of the stomach. Under normal conditions the organ should not contain any remnants of the first meal at the time of examination. The free hydrochloric acid was determined according to Töpfer's method, using dimethyl-amido-azo-benzol as an indicator.

An analysis of this table shows that normal amounts were found in 33.3 per cent., hyperchlorhydry in 30 per cent., hypochlorhydry in 16.6 per cent., and anachlorhydry in 20 per cent. It is thus clear that no definite rule can be laid down regarding the secretion of hydrochloric acid in cases of chlorosis. *Neither hyper-, hypo-, nor anachlorhydry can be regarded as the cause of chlorosis.* In the author's estimation, the abnormal results must be explained by the existence of a general neurotic condition, which is frequently observed in cases of chlorosis. In this connection it is of interest to note that increased indicanuria is not found in the majority of chlorotic patients, thus confirming the author's view that increased indicanuria may be regarded as indicating the existence of hypo- or anachlorhydry, if we except ulcer, in which case an increased elimination of indican is usually found associated with hyperchlorhydry. (See Table III.)

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[1] Leube: Spezielle Diagnostik., 1893.

[2] Cantu: München. med. Wochensch., 1894, No. 14 (ref.).

[3] Rosenheim: Lehrbuch der Verdauungs-Krankheiten, vol. I.

[4] v. Noorden: Arbeiten über Chlorose. Berlin. klin. Wochensch., 1891, No. 4.

[5] Buzelygan und Gluzinski: Internat. klin. Rundschau, 1891.

[6] Hoffmann, loc. cit.

[7] O. Schroth: Diss. München, 1896.

Haig[1] has recently suggested an increased production of uric acid, the result of digestive disturbances, as the cause of anæmia and chlorosis. This view the writer cannot share, as in his experience an increased elimination of uric acid is less frequently observed in chlorosis than in conditions which are not associated with anæmia. There is no reason why an increased production of uric acid should take place in chlorosis without a correspondingly increased elimination.

The hypothesis that chlorosis is referable to the repeated losses of blood during the process of menstruation need not be considered, as the disease not infrequently occurs in females before menstruation has been established. It would be difficult, moreover, to explain the reason why chlorosis results in such an infinitesimally small percentage of cases when compared with the total number of menstruating females.

Those, finally, who regard chlorosis as an infectious disease have still to demonstrate the specific bacillus. The occasional occurrence of enlargement of the spleen can hardly be regarded as sufficient evidence. Schroth[2] has met with splenic enlargement only twice in his series of cases, and the writer has only one case of this kind to report in a total of thirty-one cases.

From the brief analysis of the various hypotheses that have thus been offered to explain the etiology of chlorosis it is clear that *there is not one which can be regarded as entirely satisfactory. This statement, however, presupposes the unity of the disease.*

The classification of the various forms of anæmia in use at the present time appears to the writer very unsatisfactory. Strümpell[3] divides the anæmias into primary and secondary anæmias, and under the heading "simple constitutional anæmia" speaks of chlorosis and progressive pernicious anæmia.

Osler[4] likewise distinguishes between a primary and a secondary form, and subdivides the former into chlorosis and progressive pernicious anæmia. From his account it is not clear whether or not he regards the "simple constitutional anæmia" of Strümpell as a form of chlorosis. He merely defines chlorosis as an "essential anæmia met with chiefly in young girls, characterized by a marked relative diminution of the hæmoglobin."

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[1] Haig: Causation of Chlorosis. Brit. Med. Journ., 1893, p. 672.

[2] Schroth, loc. cit.

[3] Strümpell: Lehrbuch der speziellen Pathologie und Therapie der inneren Krankheiten, vol. ii. 2, p. 178.

[4] Osler: Practice of Medicine, 1st ed., p. 684.

Not many years ago it was thought that chlorosis occurred only in females about the age of puberty. From time to time cases have been observed, however, in which the chlorotic symptoms appeared much earlier; and Rieder[1] has recently pointed out that the disease may develop much later. He cites three carefully studied cases, occurring in females, in which the disease appeared at the age of thirty, forty, and forty-two years respectively. As criterion he regards: the occurrence of anæmia in the absence of a demonstrable cause, the absence of organic disease, the occurrence of a diminution in the amount of hæmoglobin associated with a fairly normal or but slightly subnormal number of the red corpuscles, and rapid improvement upon the administration of iron.

It appears to the writer that too much stress has been laid upon the occurrence of menstrual abnormalities and the "chlorotic" facies in the diagnosis of the disease. It would be better to discard the term "chlorosis" altogether, as it has reference to a symptom only, viz., the greenish-yellow hue of the skin, which is by no means always observed, its occurrence being largely restricted to brunettes. The abnormalities in the menstrual function can likewise not be regarded as characteristic of the disease, as chlorosis is not only observed before the menses have appeared, but amenorrhœa, menorrhagia, and normal menstruation may all be observed in the course of an attack. Chlorosis, moreover, has also been met with in the male, and the writer's experience has led him to the conclusion that it is not at all rare in that sex. It has been mentioned above that rapid improvement in the condition of the blood following the administration of iron is by some regarded as a criterion in the diagnosis. This can hardly be said to hold good, as cases of chlorosis are frequently seen in which the effect of iron is practically *nil*. There remains for consideration the significance of the condition of the blood. Modern writers state that a diminution in amount of the hæmoglobin, altogether out of proportion to the diminution in the number of the red corpuscles, is characteristic of chlorosis, and may serve to differentiate this form of anæmia from all other forms, viz., progressive pernicious anæmia and the secondary anæmias. It is true that in the majority of cases of chlorosis the number of red corpuscles is practically normal. Thayer[2] found the average number per cubic millimetre of the red corpuscles in forty consecutive cases to be 4,225,181, or over 80 per cent. of the normal, while the percentage of hæmoglobin for the total number was 44.1 per cent. Not rarely, however, cases are seen in which the red corpuscles are greatly diminished in number. Osler states that the lowest count in the series of cases just referred to was 1,932,000. In such extreme instances it will be found that the percentage of hæmoglobin is still lower. If we regard this symptom as pathognomonic of chlorosis, it must also be admitted that the definition of chlorosis must be extended, so as to comprise not only girls about the age of puberty, but also children and adults of both sexes. The writer systematically examined the blood of a large number of patients, and found that a diminution in the amount of hæmoglobin, associated with a normal or but slightly subnormal number of red corpuscles, is far more frequently encountered than is generally supposed, in the absence of organic changes. He has observed, moreover, that "chlorosis" is very commonly seen in children of both sexes between the third and twelfth year, as also in the adult female and in males about the age of puberty and up to the twenty-third year. It was less frequently found in males after the thirtieth year.

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[1] Rieder: Einige Bemerkungen über das tardive Auftreten der Chlorose. München. med. Wochensch., 1893, p. 225.

[2] Thayer: Cited by Osler, loc. cit.

In the following table the hæmoglobin estimations and the number of red corpuscles are given in a number of male patients. Organic changes could be excluded in every instance:

TABLE IV.

No.	Name.	Sex.	Age.	Corpuscles.	Hb.
1	R. G.	M.	8	4,236,256	45 per cent.
2	L. H.	"	32	3,476,191	33 "
3	M. T.	"	15	4,565,332	48 "
4	J. H.	"	19	4,435,261	42 "
5	O. H.	"	30	5,221,113	58 "

The question arises: What is the smallest amount of hæmoglobin that may be met with in health? The writer's experience has led him to the conclusion that amounts of hæmoglobin corresponding to 100 or over of Fleischl's instrument are only exceptionally seen in city-dwellers, and that figures varying between 80 and 100 must be regarded as normal for such persons. Percentages lower than 70, when associated with a fairly normal number of red corpuscles, or a diminution less than that of the hæmoglobin, should be regarded as indicating a condition of chlorosis, or of *simple anæmia*, a term which the writer prefers.

If we thus extend the definition of the term "chlorosis," it will be found that the hypotheses set forth above become wholly untenable, providing, of course, that chlorosis constitutes a unity. Congenital hypoplasia, the wearing of corsets, with its attendant evils, viz., compression of the thorax and abdomen, splanchnoptosis, menstrual abnormalities, vasomotor neuroses depending thereupon, autointoxication, as far as our present knowledge goes, are all factors, none of which can be said to be uniformly associated with chlorosis. *As a result of his* *study, the writer has been led to the conclusion that in the great majority of cases chlorosis is essentially a disease of malnutrition, the result very frequently of abnormal feeding in early childhood.* Objections may be raised to this opinion on the ground that chlorotic patients are usually well nourished and frequently exhibit a perfectly normal appetite as to the quantity of food; in such cases also the proteid metabolism has been found to be normal.

The latter argument may be answered first. It is true that the proteid metabolism will be found normal, if the case be studied at a hospital, where the patient is obliged to eat what is placed before him, and where he ingests weighed quantities of food. *The chlorotic patient is capable of not only digesting a normal amount of proteid material, but also of assimilating the products of digestion.* It would be faulty, however, to argue from the fact that experiments upon metabolism show a patient to be capable of digesting and assimilating definite quantities of food that the patient's nutrition is not impaired. Metabolic experiments will show that the poor, hard-worked, and ill-fed shop-girl can digest and assimilate a normal amount of nitrogenous food, but experiments are not necessary to show that the same girl's diet at home is widely different from that which she receives in a hospital.

The fact that chlorotic patients are usually well nourished cannot be regarded as a valid objection to the writer's view. In the better-to-do classes it is true that the patients usually, but not always, appear plump and well fed. A superficial examination, however, will show at once that the muscular system is not well developed and that the plump appearance is simply due to excess of fat. In that sense the German beer-drinker with his *embonpoint* and the fat woman of the dime-museum are also well nourished. An excessive deposit of fat does not indicate normal nutrition. The fat chlorotic patient can well be compared to a typical case of obesity, and anæmia is practically common to both. Among the poorer classes, on the other hand, the muscular system is not only usually defectively developed, but fat is also frequently lacking. Every physician probably has seen cases of chlorosis in which the body-weight was ninety-five pounds, or even less.

As to the third objection, namely, that the appetite of chlorotic patients is often normal as to quantity, the writer is willing to admit its truth. He maintains, however, that it is rarely normal as to quality. The capricious appetite of chlorotic girls is proverbial. Their longing for undigestible articles, such as acids, chalk, charcoal, earth, and even spiders, is well known. At the Johns Hopkins Hospital the writer had occasion to study three chlorotic girls—intimate friends—who invariably carried with them a box containing pepper and salt. Of this they partook with apparent relish, and as frequently as Mynheer of fifty years ago consulted his snuff-box. It is not the writer's intention to dwell upon this form of capricious appetite, however, but to point out the fact that a similar perversion exists regarding staple articles of food. The following cases may serve as illustrations:

CASE I.—M. C., aged twenty-four years. Intense chlorosis. The patient has scarcely ever touched any form of meat but fish. Of the latter she is inordinately fond—particularly when salted. While being treated for ulcer of the stomach, which complicated her condition, she bribed the servants of the house to bring her a piece of salted mackerel. For fats and sweets she has no liking. Toast and tea, with salted fish, have been her usual articles of diet for several years.

CASE II.—A. B., aged twenty-one years; male; this patient has never even *tasted* meat. Since childhood he has lived on little else than milk, coffee, and bread.

CASE III.—C. G., aged five years. Will not touch meat; lives mostly on potatoes, bread and butter, and coffee.

CASE IV.—E. B., aged twelve years. Will eat chicken and turkey, potatoes, bread and butter, milk, and baked apples. Of the latter, as well as candies and cakes, she is very fond. Meats other than those mentioned she will not eat.

CASE V.—E. W., aged seventeen years. Will not eat beef or mutton; does not like milk; eats potatoes, corn- and buckwheat-cakes, oatmeal, occasionally a little breast of chicken; is very fond of candies.

CASE VI.—M. G., aged sixteen years. Rarely eats meat; is a great candy-eater.

CASE VII.—M. H., aged twenty-three years. Lives principally upon toast and tea; rarely touches meat.

Careful questioning, in the writer's opinion, will almost always reveal the fact that chlorotic patients consume a very small amount of nitrogenous food, and particularly of the red meats. The majority of patients are potato-fed and inordinately fond of sweets in every form. On the other hand, cases are met with where meat is consumed in moderate amounts, but usually this is improperly prepared, viz., fried and well-done. Such patients probably obtain more fatty acids than digestible proteid material in this manner.

If the urine of chlorotic patients be systematically examined, the correctness of the writer's statement can be readily demonstrated. The specific gravity is almost always low. Inferences should, however, only be drawn when the specific gravity is determined from a specimen taken from the total quantity of urine voided in the twenty-four hours. The inorganic salts, especially the chlorides and phosphates, are likewise diminished. Most important of all, the elimination of nitrogen is diminished. There are a few exceptions in which the specific gravity and the elimination of nitrogen are increased, and which the writer is not prepared to account for; the rule, however, is that *in chlorosis we meet with a subnormal elimination of nitrogen, referable to the ingestion of an insufficient supply of proteid food, and especially of red meats.* It is the writer's belief that the great majority of cases of chlorosis are thus primarily produced, and that the various other factors, which have been incidentally mentioned, serve to aggravate the anæmic condition and render it less tractable.

As to the question, How is this perversion of the appetite brought about? it may be said that in early infancy the tendency on the part of physicians and parents is to overfeed; later, when the teeth have appeared and solid food should enter into the child's dietary, the opposite mistake is frequently made. A simple query as to the child's appetite will not reveal the error, as usually the answer is that the appetite is good. If, however, a careful inquiry be made as to what the child eats, it will be found that while a fair amount of milk is consumed, potatoes, cornstarch, bread, and the inevitable chicken-bone form the principal articles of diet. Is it surprising that the child should look pale? Certainly not. Children require much more proteid food in proportion to their body-weight than adults. If iron is then prescribed, a slight improvement may follow, but it is rarely marked, and more often *nil*. Of the correctness of this statement the writer has had occasion to convince himself again and again. Unless proteid food be administered in abundance—and it should be remembered that a child with all its teeth requires a coarser form of diet than milk—it will grow up weak and puny. A distaste for animal food develops and an attack of genuine chlorosis results when demands are made on its nervous system at school. Here the child is regarded as stupid and lazy because it does not accomplish its allotted work as well as other children. "It is kept in school" as a punishment, upbraided by its teachers, teased and worried by its comrades, until finally the increased exertions result in a breakdown. A case in point may serve as an illustration:

R. G., aged eight years. As a baby the child was at first nursed by its mother, but was later brought up "on the bottle." Up to the time the milk-diet was discontinued the general health was good. Various "paps," potatoes, and "chicken-bones" were then added by the mother. Later it was noticed that the child was pale, nervous, easily frightened, twitched in arms and legs and the muscles of the face, had night-horrors, and notwithstanding bodily punishment would wet its bed almost every night. A phimosis was found and circumcision performed. Iron was ordered in small doses, and continued off and on for the next year. The improvement was practically *nil*. The child continued anæmic and nervous up to the age of five years, when it was sent to a private kindergarten. The nervousness increased, and the child was taken away. At the age of six years it was sent to school. Reading and writing lessons apparently did not affect the child in a deleterious manner. Arithmetic, however, proved to be the stumbling-block. The nervousness increased, the anæmia became worse, and was aggravated by a severe attack of influenza. A loud systolic murmur developed at the base; palpitations, shortness of breath, and general exhaustion were the result of even slight exertion. Iron, arsenic, and manganese were all tried, with no benefit. The child's appetite craved starchy food. School was stopped, several months spent in the country (the child had lived in the country to its fourth year), no medicine was ordered, but a liberal proteid diet with bone-marrow and imported Bavarian beer. In the fall of the same year the murmur had almost entirely disappeared, the general nutrition had improved, and 75 per cent. of hæmoglobin was found with Fleischl's hæmometer.

Here a typical attack of chlorosis developed in a child at the age of six years, in which medication was of no avail, but in which a liberal proteid diet led to a fairly satisfactory result.

Other cases occur in which the child has been fairly healthy during its early childhood, but in which the chlorosis develops during the years of school-life. There can be no doubt that the mental strain is a most important factor, particularly in the case of children who have not inherited a strong constitution. The development of the sexual instinct and its common result, masturbation, moreover, deserve consideration. The writer believes that far too little attention is paid to this subject not only by parents, but also by physicians. In the case of boys the problem is not nearly so difficult to deal with, as the physician, if he suspects the practice of masturbation, will usually not hesitate to direct the father's attention to the existing evil. In the case of girls, however, he will frequently hesitate to communicate his suspicions to the parents. They would be shocked were they told that their daughter is a masturbator. The mere insinuation of such an idea would undoubtedly frequently drive the family to a more "gentlemanly" physician. Masturbation, however, is almost as common among girls as among boys, with the exception perhaps that the habit is not begun so early in the female as in the male. Without doubt, however, masturbation, particularly in weakly children, must be regarded as a most important predisposing cause of chlorosis. The writer has again and again observed that the sediment of urines from masturbating young girls contains very large numbers of epithelial cells, derived from the external genitals, and he believes this appearance to be fairly pathognomonic of masturbation, particularly if an appreciable amount of mucus is present at the same time.

While these factors, viz., mental strain and masturbation, must be regarded as important predisposing causes, a perversion of the appetite, and the resulting malnutrition, are still more important, according to the writer's experience. In the morning the child commonly hastens off to school without having had a sufficient breakfast. If a lunch be taken along, it is often either insufficient in amount, or it has become distasteful by the time recess occurs. The pies and buns which can be readily procured in the neighborhood are, hence, preferred; candies also play their part; and at three o'clock, when the child returns home, the appetite is gone. A late dinner does not mend matters much, and ere long, in consequence of an insufficient supply of food of unsuitable quality, bad air, the continuous confinement in the same position, mental strain, and masturbation, a chlorotic attack follows in those who have not entered upon life with a specially good constitution.

Among the poorer classes it is well known that a sufficient quantity of suitably prepared meat is only exceptionally found upon the dinner-table. Tea and toast are a form of diet upon which many poor shop-girls live almost exclusively. Lentils, peas, and beans are not sufficiently *aristocratic* for those who are earning *enough* money to buy them. Potatoes, fried meat swimming in fat, oatmeal, corn-, buckwheat-, and griddle-cakes, hot bread, buns, fried tomatoes, tea and coffee are the articles of food most commonly consumed by the laboring classes. Were less money expended by them in imitating the household and habits of the wealthier classes, their children would not so frequently present the puny, anæmic appearance which has given rise to the establishment of fresh-air funds and country homes.

Among young adults it is also usually possible to trace the anæmic condition to an insufficient supply of proteid food. Sedentary habits, sexual excesses, mental strain, worry, grief, are all factors which will lead in time to a general breakdown. The appetite is soon affected, this and that article of food is thought to disagree and is abandoned, until finally a condition develops where the patient is practically starving. The anæmia is thus readily accounted for. A few examples may not be out of place:

N. C., aged thirty years. The family history is fair: the father died from nephritis; the mother, two sisters, and two brothers are living and well. As a child the patient passed through the usual diseases. Her health was good until eight years ago. Her weight then was 118 pounds. At that time her *fiancé* died quite suddenly. Her father's death occurred soon after. Symptoms of failing health began to appear. Her appetite diminished, loss of flesh occurred, weakness resulted, the bowels, regular heretofore, became sluggish. The patient went from bad to worse. Sanitariums were frequented. Amenorrhœa occurred, and a gynecologist was called in consultation. No improvement resulted, and a condition of complete invalidism developed. No hysterical symptoms. When the patient was first seen she weighed 74 pounds, and had only 20 per cent. of hæmoglobin, while the red corpuscles numbered about 3,000,000. Examination of the head, chest, arms, and legs was negative. There existed, however, an exaggerated grade of splanchnoptosis. Examination of the stomach showed moderate atony and hyperchlorhydry. The urine was negative. The patient, who had gradually discarded one article of food after the other, fearing that it disagreed, was placed upon appropriate diet, in which animal proteids predominated. No medication beyond nux vomica was employed. In the course of eight weeks the patient's weight had increased to 86 pounds, and the hæmoglobin had reached 60 per cent.

An attack of true chlorosis here developed following intense grief, which led to perversion of the appetite and profound anæmia. Marked improvement resulted from the administration of large amounts of proteid food.

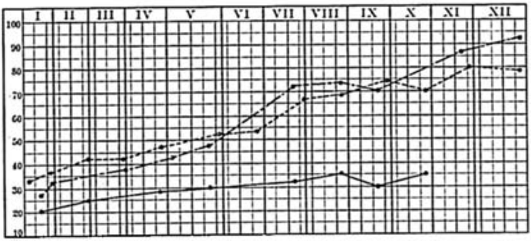
Miss X., aged twenty-eight years. The patient's family history is good. Up to the age of twenty-four years she had been strong and well, excepting the usual diseases of childhood. She was engaged to a young man with no prospects of an early marriage. Her evenings were generally spent with her *fiancé*. Her stomach-contents were examined at that time, as she began to complain of indigestion, general lassitude, and slight loss of flesh. Normal results were obtained. The right kidney could then be felt below the costal margin. Heart, lungs, etc., were all normal. A few days later diarrhœa occurred without a demonstrable cause; the urine, which had previously contained a normal amount of indican, gave a most intense reaction, and after Ewald's test-meal not a trace of free hydrochloric acid was found. It was then ascertained that during the preceding evening she had become highly excited sexually, and that an orgasm had occurred without intercourse. A few days later her condition was normal. The following week there was a repetition of the attack, called forth in the same manner. This occurred several times, until the patient was sent to the seashore, without her *fiancé*. Upon her return she was decidedly anæmic; hæmoglobin 25 per cent.; the menses were irregular; marked dyspeptic symptoms existed; there were loss of appetite, constipation, and general prostration. The kidney, moreover, could be felt in the right iliac fossa. She was now given Blaud's pills for three months; after that time the hæmoglobin had increased only to 43 per cent. The iron was then stopped and a liberal proteid diet ordered. She steadily improved, and the last examination showed 84 per cent. of hæmoglobin.

In this case an attack of profound chlorosis developed from ungratified sexual desire; dyspeptic symptoms and anorexia followed, resulting in anæmia. Recovery occurred upon the administration of a liberal proteid diet.

It would be an easy matter to detail many such cases. The writer believes, however, that he has sufficiently demonstrated that *chlorosis is in the great majority of cases the result of malnutrition, dependent upon the consumption of an insufficient amount or of an unsuitable quality of proteid food.*

Heretofore iron has played the most prominent *rôle* in the treatment of chlorotic patients, and Osler states in his *Practice:* "The treatment of chlorosis affords one of the most brilliant instances of the specific action of a remedy. Apart from the action of quinine in malarial fever, and of mercury and iodide of potassium in syphilis, there is no other remedy the beneficial effects of which we can trace with the accuracy of a scientific experiment." In a similar tone many other clinicians express themselves. The writer, however, cannot share this enthusiasm to such a degree. It is true that many chlorotic females show a marked increase in the amount of hæmoglobin when iron is administered. Blaud's pills, containing each two grains of the sulphate of iron, when given in increasing doses certainly cause a marked increase in some cases. In many others, however, no result worth mentioning is obtained. The writer well remembers the large number of chlorotic patients which A. Robin kept in his wards at the Pitié of Paris, and which he was in the habit of showing to his students as cases in which iron produced no result.

TABLE V.



The broken line shows the more common effect of iron in chlorosis. (Taken from OSLER.)
The dotted line shows the effect of the writer's diet in a case in which no results could be obtained with iron.
The solid line shows the absence of any marked results with iron.
The heavy vertical lines have reference to intervals of one week.

The following two instances may serve as further proof that we are by no means justified in ascribing to iron a specific influence.

M. G., aged fifteen years. The patient's principal complaints are pain in the abdomen after meals, nausea, and slight elevation of temperature. The family history is good. At the age of five years she had a severe attack of scarlatina. In addition she has had the usual diseases of childhood. During the last two years she has been anæmic. The appetite is stated by the mother to be "most delicate." She is inordinately fond of candies. About fifteen minutes after meals she complains of a heavy feeling about the stomach, and, at times, of pain, which may be quite severe, but is relieved by pressure. Several times she has vomited. Quite frequently she has also had headaches. The bowels are fairly regular. There is no cough or expectoration. Once or twice, when in a crowded room, she has fainted. This patient has been treated for chlorosis, and had been taking iron (Blaud's pills) and Gude's pepto-mangan for two years practically without interruption. When first seen she had only 33 per cent. of hæmoglobin. The specific action of iron was certainly not manifest in this case.

E. W., aged seventeen years. This patient had likewise been taking iron, manganese, and arsenic for two years. On her father's side there is a history of tuberculosis; he himself, however, is living and well. On the mother's side the history is good. The patient has not passed through any serious illness, but has, nevertheless, been always ailing and weakly. The usual chlorotic symptoms are very marked. The hæmoglobin does not exceed 37 per cent.

Every physician who has had occasion to observe a large number of chlorotic patients, and has followed the results of his treatment with the hæmometer, has undoubtedly met with similar cases in which the effect of iron was practically *nil*.

There still remains the fact, however, that iron is certainly beneficial in many instances. How can this be explained? In the opinion of the writer the beneficial effects obtained are simply due to a stimulating effect upon the appetite. The iron itself which is ingested certainly does not serve to increase the amount of hæmoglobin, as it has been shown that practically the total amount ingested is eliminated in the feces.

Numerous observations having shown that iron in the inorganic form frequently produces no satisfactory results in cases of chlorosis, other preparations have been placed upon the market from time to time. Among these may be mentioned ferratin, hæmoglobin, hæmatogen, hæmalbumin, etc. From the writer's observations there can be no doubt that these frequently produce better results than the ordinary inorganic forms of iron, but he also believes that the beneficial effects obtained, where iron in other forms has failed, are largely due to the proteid material which they contain.

During the last three years the writer has been in the habit of treating his cases of chlorosis without drugs, and he claims to have obtained results which at least are as satisfactory as those observed in cases in which iron exhibited its "specific" effect. Starting upon the hypothesis that an insufficient consumption of proteid food must be regarded as the causative factor in the great majority of cases of chlorosis, he has ordered for such patients a diet in which proteid material largely predominated. Before proceeding to detail this diet, it may be mentioned that it has been long known that with a diet composed exclusively of non-nitrogenous food the percentage of hæmoglobin undergoes a notable diminution, while it is augmented by a diet rich in proteids.

The diet which is ordered is given below. Additional instructions, however, are also given: Meals should be taken five times daily, viz., at 8 A.M., 11 A.M., 2 P.M., 5 P.M., and 7 P.M. Rest after meals is insisted upon whenever hyperchlorhydry is found to exist, while moderate exercise is advised whenever hypochlorhydry is found to exist. Ten hours of sleep, warm salt-water baths twice weekly, dry friction in the morning, avoidance of society, etc., are other factors which enter into the plan of treatment.

Diet: Of meats the patient is instructed to indulge liberally in beef and mutton. Raw beef, finely hashed or scraped, is taken once daily, preferably at 11 A.M., on toast or stale bread, with pepper and salt.

The so-called white meats are only exceptionally allowed. At dinner-time the patient also receives from one-half to one ounce of bone-marrow, obtained from the shin-bone of the ox. This should be brought upon the table while hot.

Of vegetables, preference is given to *purées* of peas, beans, and lentils; but green and white vegetables are not excluded. Potatoes are either not given at all, or only once daily, and in small amount.

Of fruits practically all are permissible, with the exception of berries. These may, however, also be given in *purée* form, when deprived of their seeds. Apples are excellent and well borne in most cases.

Of bread, rye-bread is preferred; it should be twenty-four hours old. Toast, Zwieback, and rebaked bread are likewise allowed.

Puddings, pies, pastry, and preserves are interdicted. The same holds good for hot bread, corn-, buckwheat-, and griddle-cakes, and oatmeal.

Coffee and tea are prohibited; milk, buttermilk, cocoa (particularly those forms in which the fat has not been wholly extracted, such as Philips'), and a good quantity of dark beer (Salvator, Pschorr, Würzburger, Klosterbräu, and Bartholomay's Ne Plus Ultra), one pint daily, constitute the beverages which are consumed in addition to one or two pints of water. The writer wishes to insist especially upon the value of dark beer in cases of chlorosis. One pint should be consumed daily; one tumblerful at 11 A.M., with the beef sandwich, and one just before retiring.

With the treatment thus outlined the writer has obtained most satisfactory results in the absence of medication, results, moreover, which compare very favorably with the best that have ever obtained with iron, manganese, and other preparations of a medicinal character.

This treatment is not new, and the writer does not lay claim to any originality in this respect. He simply wishes to emphasize its importance, and believes that we are more entitled to ascribe a specific action to a liberal proteid diet in cases of chlorosis than to iron or any other drug. We can, moreover, trace the beneficial results of this plan of treatment with the accuracy of a scientific experiment.

It is not the writer's intention to insist upon the treatment of every case of chlorosis with beef, bone-marrow, and beer. Among the poorer classes of people who frequent hospital dispensaries such a plan of treatment would be impossible to carry out. Iron may there be prescribed as heretofore. Among the better-to-do classes, on the other hand, the treatment which has been outlined should be invariably instituted whenever a brief course of iron has not led to a satisfactory result. It is useless to drug such patients continually.

In conclusion, a few words regarding the value of bone-marrow in the treatment of chlorosis may not be out of place. As far as the writer has been able to ascertain, the first observations in this direction were published by Billings,[1] who was led to his investigations by the reports of Fraser,[2] Bigger,[3] and Danforth[4] upon the value of extract of bone-marrow in cases of pernicious anæmia. Billings cites four cases which were thus treated. Two of these were cases of pernicious anæmia, the third a chlorotic girl, and the fourth a "chloro-anæmic" boy.

The bone-marrow was given in the form of a glycerin-extract, which was prepared in the following manner: "Twelve sheep's ribs, carefully scraped, were chopped into small fragments and rubbed up in a mortar with one pound of glycerin. This was allowed to macerate for three or four days, being kept in a refrigerator during that time. It was then strained through gauze and the resultant liquid administered in teaspoonful doses three times a day."[5]

In the chlorotic girl 32 per cent. of hæmoglobin was noted upon admission to the hospital. For the first ten days no treatment was instituted. At the end of this time an increase of 6 per cent. was observed. The extract was then given for sixteen days, when the hæmoglobin amounted to only 40 per cent. In other words, while an increase of 6 per cent. resulted without treatment during the first ten days, a further increase of only 2 per cent. was observed after the patient had taken the extract for sixteen days. This observation is rather unfavorable for the value of red bone-marrow in chlorosis.

In the "chloro-anæmic" boy, on the other hand, an increase of from 35 to 68 per cent. was noted in one month. The administration of Blaud's pills, which was begun at the end of the month, did not, however, lead to a further increase at the end of the next two weeks. The bone-marrow in this case certainly gave more beneficial results than Blaud's pills.

Billings concludes: "The extract of bone-marrow may be of value in cases of ordinary anæmia and chlorosis, such as would be benefited by iron in other forms." He ascribes the benefit obtained in the one case to the iron which the bone-marrow contains.

As has been indicated above, the writer regards bone-marrow as a valuable article of diet in the treatment of chlorosis. Curiously enough, most benefit was obtained with the marrow of the long bones of the ox, of which one to one and a half ounces were administered daily. As the general plan of treatment already described was carried out in almost every instance, it is impossible to determine to what extent the improvement was due to the bone-marrow alone. In only three instances were the patients permitted to follow their usual mode of living. In these three cases an increase in the amount of hæmoglobin was also noted, but was certainly not so marked as in those in which special stress was laid upon the administration of a large amount of proteid food. On the other hand, it may be said that the increase in the amount of hæmoglobin was more rapid and more marked when bone-marrow also was given.

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[1] J. S. Billings: Therapeutic Use of Extract of Bone-marrow. Johns Hopkins Hospital Bulletin, November, 1894.

[2] Fraser: British Medical Journal, June 2, 1894.

[3] Bigger: Lancet, September 22, 1894.

[4] Danforth: Chicago Clinical Review, 1894, vol. iv.

[5] The glycerin-extract may be obtained from the Bureau of Diets, 525 North Charles Street, Baltimore, Md.

The writer is not prepared to offer any hypothesis as to the reason why bone-marrow is of value. The fact that practically the same results may be obtained with the yellow marrow of the long bones as with the red marrow certainly speaks against Billings's assumption that the beneficial results which may be obtained are due to the iron which marrow contains.

Abnormalities of "internal secretion" are correctly regarded as the basis of a number of diseases, among which may be mentioned myxœdema, cretinism, Basedow's disease, acromegaly, Addison's disease, pancreatic diabetes, and the affections shown to result from premature loss of the functions of the ovaries and testicles. It would be tempting to view chlorosis in this light. The writer does not feel justified, however, with the data at his disposal, to venture upon such a wide field for speculation.

Conclusions:

1. An anatomical basis of chlorosis has not been satisfactorily determined.
2. A perversion of the appetite—excessive consumption of starches and sugars—is a common symptom of chlorosis.
3. The development of chlorosis is due to an insufficient consumption of animal proteids.
4. Chlorosis is far more common than is generally supposed, and occurs in both sexes and at almost all ages.
5. The diagnosis of chlorosis should be based altogether upon an examination of the blood.
6. The term chlorosis should be discarded, and "simple anæmia" substituted.
7. Iron is not a specific in the treatment of chlorosis.
8. In the treatment of the disease attention should primarily be directed to the diet.
9. In cases in which iron fails satisfactory results may be obtained, without medication, from a suitable diet, in which animal proteids, bone-marrow, and dark beer are the principal factors.
10. The beneficial effects of bone marrow are not due to the amount of iron which it contains.